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ABSTRACT

Current views both of reading and of understanding spoken language conceptualize the process of deriving meaning as similar to hypothesis testing. The listener or reader is seen as selecting whatever information is required to confirm the hypothesized meaning. In the present study, 60 children (12 each in grades four through eight) reworded linguistically complex sentences, with clarity of expression as the criterion. The children were retested on the same task one year later. Results were analyzed separately for the number of sentences retained as originally worded, the number with semantically based changes, and the number with syntactically based changes. The only significant differences for either syntactic or semantic changes were related to the familiarity of content: sentences that reflected expected agent/action combinations were less likely to be reworded than were sentences that contradicted expected agent/action combinations. (AA)

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Semantic and Syntactic Strategies in Re-encoding Linguistically Complex Sentences

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Much of the current thinking about the receptive functions of reading and understanding spoken language focuses on the active contribution made by the reader or listener in "constructing" meaning. A recent review of research (Magoon, 1977) demonstrates that American psychologists are giving greater attention to the constructive nature of many aspects of human behavior, certainly to behavior related to schooling.

It is possible that comprehension of language, in particular, demands an even greater cognitive contribution from the comprehender than does, for example, perceptual comprehension (Bransford & McCarrell, 1974). In understanding spoken or written language, the active contribution of the listener or reader is essential if meaning is to be grasped.

Goodman (1965) asserted that reading could be viewed as a selective process in which the individual predicts or anticipates meaning, basing this prediction on minimal orthographic cues. He characterized reading as a form of hypothesis testing, terming it a "psycholinguistic guessing game" (Goodman, 1965). During that same era, Chomsky and Halle (1968) wrote that one's perception of spoken language is a function not only of the "signal," but also

of the listener's knowledge of language and extragrammatical factors (p. 294). "[E]ven crude agreement," they wrote, "between the external stimulus and the internally generated hypothesis serves to confirm the latter. In other words the dependence of perception on properties physically present in the signal is less than total" (Chomsky & Halle, 1968, p. 294). That is, the meaning derived from an utterance is dependent on the speaker's intention as encoded into a "signal" and on the listener's creative and constructive interpretation.

In the past ten years, research on language acquisition has shown that individuals contribute to understanding an utterance by exploiting "shared intentions based on prior knowledge, the context of the utterance, and habitual patterns of interaction" (Olson, 1977, p. 261). Thus, the focus of attention in much recent empirical work has shifted to characteristics of listeners and readers such as knowledge of the world, relevant belief systems, and expectations (Gowie & Powers, in press). Along similar lines, Goodman and Goodman (1977) wrote, "In both reading and listening, prediction is at least as important as perception. What we think we have heard or read is only partly the result of sensory data; it is more the result of our expectations" (p. 324).

Thus, both reading and understanding spoken language are currently viewed as processes in which the listener or reader

selects whatever information he or she requires in order satisfactorily to confirm hypothesized meaning. Such an interpretation leads to the question of what it is that individuals select as they listen or read. Traditionally, the answer has been that they attend to the words conveying the most information generally, or to the words conveying needed information, specifically.

PURPOSE

The research reported here was designed to address the question of what aspects of sentences convey the greatest information to older children and young adolescents. Stimulus materials were limited to one particular grammatical structure, constituting the only exception to a general pattern in English, the Minimum Distance Principle (MDP).[4] The MDP describes a particular type of sentence, e.g., The father told the boy to set the table, containing a subordinate complement verb phrase at the end. In these sentences, the noun phrase nearer to the complement is the agent who is to carry out the action. Thus, in the example, it is the boy who should have set the table. When the verb promise is inserted as the main verb in the sentence of this form, the MDP is violated: then the first agent, the one who promises, is the one who will carry out the action in the complement verb phrase.

That violations of the MDP are developmentally late acquisitions has been amply demonstrated (C. Chomsky, 1969; Gowie &

Powers, in press; Kessel, 1970; Kramer, Koff, & Luria, 1972). Researchers have explained the phenomenon, following C. Chomsky (1969), as an example that children learn general patterns in their language before learning exceptions. However, more may be involved. A recent study by Richek (1976) has shown, first, that MDP-violation is a psychological principle with wide application (p. 801), and, second, "that the difficulty of MDP-violating structures is likely to be due to the presence of the deceptive, and more proximate, alternate noun" (p. 805-806), not just to the distance between agent and action. That is, in a sentence such as, The boy promises the girl to climb the tree, it is the boy who will climb the tree, but, as the nearer noun, and as one who could climb the tree, the girl presents a plausible alternative to individuals who haven't fully mastered the structure.

The method employed in the present research involved a combination of listening and reading, with a spoken response. Subjects were asked to select the clearest means of expressing the ideas in the linguistically complex stimuli. They were given three choices of ways to express the idea in each item. These choices were based on primarily semantic resolution of the complexity, syntactically-based resolution, or involving no change in the sentence. Additionally, the familiarity of the content was varied, such that half of the sentences reflected expected agent/action

combinations ("harmonious"), and half contradicted them ("contrary").

METHOD

This research was conducted in two phases, with 12 months intervening. Furthermore, each phase in the data collection involved two steps. First, the children and adolescents were interviewed individually for the purpose of identifying aspects of their belief systems, or knowledge of the world, which would be relevant to the stimulus items used in the second part of the study. Expectations were identified related to roles of mothers, fathers, boys, girls, and teachers. Specifically, Ss were asked who would be the most likely agent to carry out 20 tasks such as housework, e.g., washing windows, making beds; activities associated with the school day, e.g., drawing a picture, going outside to play; and leisure-time activities, e.g., climbing trees, shooting squirtguns.

The second part of each data collection involved asking Ss to answer several questions about the sentences, including how they could be worded most clearly. All ten sentences had the same MDP-violating structure. However, harmonious sentences contained messages that corresponded with Ss' prior knowledge (e.g., The girl promises the mother to make the bed), whereas contrary sentences contained messages that ran counter to Ss' prior knowledge (e.g., The father promises the boy to shoot the squirtgun). The same ten sentences served as stimulus materials both years.

Population and Sample

The population for this study consisted of male and female children in grades four through eight (during year one) attending two public elementary schools, a junior high school, a parochial school, and, during year two, also a public high school in the same geographic and socio-economic region of a suburban centralized school district. Residents of this community are speakers of standard English. Any child receiving special instruction from a speech therapist or reading consultant was excluded.

A sample of 12 was drawn from each of the five grades; all 60 participants were still available a year later.

Procedures

Identical procedures were followed both years. All experimental materials were individually administered. During the assessment of expectations, Ss were asked to respond according to what they thought was most common, i.e., according to which agent usually carried out each action. Hence, there were no "wrong" answers. In the second part of each data collection, E read each sentence aloud, asked a question measuring literal comprehension of each sentence, then instructed the Ss to evaluate whether the sentences "sounded right." Next, Ss were asked to specify any unacceptable element(s), with E repeating the choices based on syntactic, semantic, and cognitive constraints. Finally, Ss selected the clearest way of

expressing each sentence, again with E presenting the choices.

Given the sentence, The girl promises the mother to make the bed, a predominantly semantically-based change would be, The girl agrees (or offers) to make the bed (for the mother). A predominantly syntactically-based change would be, The girl promises the mother that she will make the bed. (Certainly, both alternatives, not only the syntactically-based choice, affect the surface structure of the sentence.)

Semantically-based changes--coming earlier in the sentence and substituting a different main verb for promise--clarify the role of the agent. That is, rather than promising, the agent may offer, agree, or say he or she will carry out the action indicated. One particular sentence, The father promises the mother to get dinner ready, was often changed in this manner. While most children in the sample thought that fathers did not usually prepare dinner, they could accept fathers' occasional offers to do so.

Changes in the stimulus items that were classified as predominantly syntactically-based retained the promise, therefore occurred later in the sentence, and tended to reinforce who the agent was. For example, in the alternative sentence, The father promises the mother that he will get dinner ready, the presence of the masculine pronoun makes clear that it is the father who will prepare dinner. Thus, given the prior belief or expectation that

fathers usually do not prepare dinner, Ss could choose to express that belief or expectation linguistically by explaining why fathers might behave so uncharacteristically, or by emphasizing that, indeed, this time it was Dad who was in the kitchen.

Design and Data Analysis

Children's selections of the clearest means of expressing the stimulus sentences provided the data of interest here. Because Ss chose only one restatement of each sentence, their responses could not be analyzed as independent scores. Therefore, a single analysis of variance was inappropriate. Three separate ANOVAs were performed, in each case with the same design, group by year by expectation (5 x 2 x 2), with repeated measures over the dimensions of year and expectation. (Because comprehension was at a level above 99 per cent both years, there was insufficient variance in this measure to include it in the experimental design.)

RESULTS

Since three ANOVAs were performed, the results will be presented in three separate sections.

"Same" Wording

With the number of sentences retained as worded as the criterion, year, $F(1,55) = 6.57$, $p < .025$, and expectation, $F(1,55) = 14.62$, $p < .001$, were significant sources of variance.

Subjects considered more sentences clear as worded during year one (mean = 1.87) than during year two (mean = 1.41). The fact that group was not a significant effect reflects the absence of any specific age-related trend in the data. However, the significance of the main effect due to year means that, as they matured as a group, children between grades four and nine increasingly chose to rephrase the stimulus sentences rather than to retain them as worded.

Expectation was also a significant source of variance in this analysis. Collapsing over the dimensions of group and year, more harmonious items were retained as worded (mean = 1.98) than were contrary items (mean = 1.30). Thus, when the content of the sentences reflected Ss' prior knowledge or expectations, fewer restatements resulted. Therefore, the more the individual can contribute, or the more the individual already "knows" what the message is, the less he or she needs to "work out" or clarify, semantically or syntactically, what the sentence means.

Semantically-Based Changes

When semantically-based changes in wording were examined, expectation was the only significant source of variance, $F(1,55) = 4.69$, $p < .05$. More semantic changes were made in contrary sentences (mean = 2.12) than in harmonious sentences (mean = 1.69). Neither year nor group was a significant main effect. Therefore, in the

age range investigated here, the use of semantic strategies for clarifying sentence meaning is independent of developmental status. Use of such strategies by children in this age range appears to be an individual, rather than age-related, difference.

Syntactically-Based Changes

The third analysis, examining syntactically-based changes, disclosed one significant source of variance. Expectation was the only significant effect, $F(1,55) = 12.33$, $p < .001$. More syntactic changes were made in contrary sentences (mean = 1.58) than in harmonious sentences (mean = 1.30). Again, as with semantic changes, neither year nor group was a significant source of variance, either as a main effect or in any interaction. Use of syntactic strategies, also, appears to be an individual matter.

DISCUSSION

The present data indicate that individual differences exist among older children and young adolescents regarding what they consider the most salient and important aspects of the stimulus sentences. Reasons for individual differences, in the context of this research, may be both metalinguistic and extralinguistic in nature.

Metalinguistic Differences

Older children and young adolescents may differ in their ability to compare varieties of the same sentence and to decide

which form is clearest. During the process of comparing, some Ss may even go beyond the choices presented, and may produce other versions of the sentence; they may formulate their preferred version, and then decide which of the choices is closest to theirs. (Further research might include asking Ss to report the procedure(s) they followed in selecting the clearest form of the sentences.) An integral part of comparing versions of the same sentence might also involve imagining contexts in which the event might occur, then "matching" to find the sentence containing the greatest number of elements present in the S's "script" for that event. In the latter case, Ss would really be choosing the most plausible alternative rather than the clearest; if such were the case, the instructions would need to be sharpened in future research.

Olson (1977) suggested that an aspect of language development that continues well into the school years is "mastering the conventions both for putting more and more of the meaning into the verbal utterance and for reconstructing the intended meaning from the sentence per se" (pp. 261-262). The present research required Ss to do both. It is possible that the results reflect individual differences in the ability to conventionalize meaning, or to make decisions based on one's knowledge of conventions. Along similar lines, Brewer (1974) pointed out that, as part of learning language, we learn "how to express knowledge in linguistic form" (p. 289).

Thus, the present results may reflect differing abilities in telling what we know, also.

Extralinguistic Differences

The significance of expectation in determining the number of stimulus sentences retained demonstrates that having prior knowledge appropriate to the actual content or message facilitates language processing. One reason why this is so may be related to a statement by Bransford and McCarrell (1974) that, "It appears reasonable to suggest that words and sentences specify some abstract conditions concerning the nature of the relations and the participating entities to be considered, and that it is the comprehender's ability to think (i.e., create situations such that the relations can be realized) that allows him [or her] to understand what the sentence might mean" (p. 213). The ability to construct meaning successfully from a sentence requires that the individual integrate or synthesize whatever relevant knowledge he or she may have available via the higher mental processes (Brewer, 1974).

Olson (1977) has summarized much of the research along these lines as indicating that, "Comprehension. . . may be represented by a set of procedures that involve selectively applying one's personal experiences or knowledge of the world to the surface structure of sentences to yield a meaning. In so doing, one

elaborates, assimilates, or perhaps 'imagines' the sentence" (p. 272).

We began by asking what Ss attend to when faced with a linguistically complex sentence. Like so many questions, this one is best answered by, "It depends." Generally, as long as the message corresponds with Ss' belief systems, knowledge of the world, or expectations, the sentence tends to be deemed clear as stated; under such conditions, complex syntax is not disturbing. When the message does not quite "fit" Ss' expectations, then changes in the sentences may be made, using semantic or syntactic strategies in order to clarify meaning.

IMPLICATIONS FOR READING

Implications for this research for reading instruction are exploratory and suggestive in nature. Given a psycholinguistic view of the reading process, one way to reduce the task requirements of reading would be to employ materials worded in accordance with children's judgments regarding clarity. This might allow readers to bypass some intermediate steps in processing by reducing some of the hypothesizing and confirming or disconfirming of hypotheses. Additionally, if the content were familiar, and wording reflected children's preference, reading comprehension should be facilitated.

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Footnotes

1. Requests for reprints should be addressed to Cheryl J. Gowie, Curry 109, UNC-G, Greensboro, North Carolina 27412.
2. The data collection during year one was supported in part by a grant to the senior author from the Excellence Fund of the University of North Carolina at Greensboro.
3. The authors appreciate both the cooperation of St. Pius X School, Loudonville, New York and of North Colonie Central Schools, Newtonville, New York, and the commitment to educational research expressed by their administrators.
4. The Minimum Distance Principle states that, in a sentence of the form

   (1) NP_1 vb NP_2 to inf vb

   noun phrase$_1$ verb noun phrase$_2$ to infinitive verb

   (The girl tells the boy to feed the dog.)

   the second noun phrase, as the one closer to the infinitive, identifies the agent who carries out the action indicated by the complement verb. Most verbs which can be used in sentences of this form (e.g., command, expect, order, persuade, require, tell, urge, want) follow the MDP. However, the verb promise is always an exception to the MDP. When promise is inserted in a sentence of form (1), the first noun identifies the subject who will carry out the action indicated by the infinitive.

5. Relevant to the use of promise in this research, Webster's Third International Dictionary of the English Language Unabridged (Springfield, Mass.: G. & C. Merriam, 1966) defines promise, as a noun, as a declaration that one will do or refrain from doing something specified; as a verb, to engage to do or bring about, to give ground for expecting; and notes that implications include: future, binding, solemn, formal, and indicating a definite agreement.